

# The Invasive Species Language Workshop: Final Report

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*In-person workshop participants gathered in Washington, D.C., for the two-day event.*

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## Executive Summary:

The use of message frames and metaphors is common within science communication as a method of effectively discussing complex topics using frames of reference the audience understands. This is particularly true in communicating research about invasive species. While the use of these communication tools is undoubtedly helpful, invasion biology lends itself to the use of militaristic and nativist language and metaphors, which can have unintended consequences that are counterproductive to invasive species management efforts. Species naming conventions are likewise complex, with some species bearing common names that may reinforce xenophobic concepts or even contain racial slurs. Despite the known need, there have been limited national efforts to develop better and more inclusive guidelines for invasive species communication.

The Invasive Species Language Workshop, hosted by Sea Grant and NAISMA in Washington, DC during National Invasive Awareness Week 2024, brought together more than a dozen researchers and practitioners from across environmental disciplines and agencies to address these communication needs and develop a path forward. Funding was provided through a National Sea Grant Office Special Projects Competition FY2023 Workshops and Professional Meetings grant. The workshop included Sea Grant staff, state, federal, and municipal agency invasive species managers, and nongovernmental organization representatives who came together to develop an action plan and recommendations that can be used by partners nationally to improve this aspect of invasive species management.

The half-day hybrid workshop featured presentations on efforts in renaming species, standardizing terminology, emotional considerations and framing, social context and inclusivity, and interventions and collaborations. These presentations highlighted the need for inclusive and accurate language in invasive species management, with efforts focused on community engagement, standardization of terminology, and reframing messaging to promote positive action. More than 400 people attended the virtual workshop, and a post-event evaluation suggests that attendees found the event useful and learned new information because of it.

The in-person workshop used semi-structured discussions to share information, identify consistent issues, and develop priorities for work on these topics. These priorities include:

- *Building Evidence of Impact and Harm*
- *Identifying Networks of Change and Building Support*
- *Coproduction of Interventions for Changing Language and Names*
- *Operationalizing Interventions for Change*

Further research on these topics can help build stronger evidence for the need for and positive impacts of this work, while developing the pathways and programs to implement it as science practitioners and communicators. Efforts like the Invasive Species Language Workshop

demonstrate collective steps towards more inclusive and effective communication strategies. By embracing alternative language and naming conventions, researchers and communicators can foster broader support and ultimately enhance invasive species management practices.

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## **Background:**

Effective communication about invasive species presents a multifaceted challenge. In addition to technical terminology, figurative language such as metaphor and allusion plays a pivotal role in shaping knowledge users' perceptions and scientific understanding. While the use of metaphor can simplify complex concepts to improve public awareness and understanding of invasive species and their impacts, using certain words and message frameworks carelessly introduces the risk of public misunderstandings and can undercut the goals of doing science in a more inclusive way (Taylor and Dewsbury 2018).

Military and nativist metaphors are prevalent in invasion biology, invoking powerful emotional responses but also perpetuating problematic narratives (Lower and Campbell, 2024). While war-like language can have strong emotional appeal and sometimes garner political support for species management, it oversimplifies the nuanced relationships between humans and invasive species (Larson 2005). When invasive species are framed in a war-like context, this messaging deflects attention from the root causes of biological invasions: that humans wittingly or unwittingly introduced the species to new environments in the first place. Similarly, nativist rhetoric, while attention-grabbing, can fuel anti-immigrant and xenophobic sentiments and undermine efforts toward inclusivity in science communication (Subramaniam 2001).

Species naming conventions pose additional challenges, with some names perpetuating racial biases or historical injustices (Herbers et al 2022, Simberloff 2003). Place-based names can inadvertently stir controversy and division along lines of ethnicity or nationality, as seen with terms like "Asian carp" amidst increased anti-Asian sentiments stemming from the COVID-19 pandemic (Weber et al 2024, Kokovsky et al. 2018).

Inconsistent language and interpretations within invasion biology further complicate community engagement and management efforts. The militaristic and nativist language so prevalent in invasion biology language can alienate immigrants and individuals with war-related experiences, undermining support for invasive species management (Cheng et al 2023). Despite grassroots efforts and some successes in renaming species, a lack of standardized processes hinders broader adoption of more inclusive language.

The table below provides a brief overview of relevant literature supporting each of these themes as a starting point for further reading. Additional resources may be found in the Appendix, including the Rhetoric of Invasion Reading List created for this workshop.

**Table 1: An Overview of Inclusive Language Literature**

CATEGORY	TOPIC	THEME
Language issues	Metaphors	<ul style="list-style-type: none"> <li>• Military metaphors displace responsibility/oversimplify issue (Larson 2005, Simberloff 2003, Subramaniam 2001)</li> <li>• Scientific framings are as effective as militaristic/nativist (Shaw et al 2021),</li> </ul>
	Tone/Emotional Valence	<ul style="list-style-type: none"> <li>• Being too harsh turns potential allies off (Cheng et al 2023)</li> </ul>
	General	<ul style="list-style-type: none"> <li>• Careless use of metaphors/vocabulary can cause more harm than good (Lower &amp; Campbell 2024, Taylor and Dewsbury 2018)</li> <li>• Existing conflicts can be exacerbated; knowledge of social context important (Crowley et al. 2017, Davies 2021)</li> <li>• Differences in use of technical terminology about invasive species can confuse both managers and the public (Iannone et al 2020)</li> </ul>
		<ul style="list-style-type: none"> <li>• Inclusive language is a cross-disciplinary issue in STEM (Herbers 2022, WHO Guidance 2024)</li> </ul>
Name issues	Scientific Name Problems	<ul style="list-style-type: none"> <li>• Transdisciplinary naming issues (Herbers 2022)</li> </ul>
	Common Name Problems	<ul style="list-style-type: none"> <li>• Spongy moth (Lancette 2021), fish names (Tracy 2022)</li> </ul>
	Place-based Name Problems	<ul style="list-style-type: none"> <li>• “Chinese/Japanese/oriental” as problematic naming terms (Weber et al 2024), “Asian” carp (Kocovsky et al. 2018), Entomological Society of America guidance in Better Common Names Project (2022)</li> </ul>
	Species Named After Someone Problematic	<ul style="list-style-type: none"> <li>• Eponymy is often regretted in hindsight when the person being named after doesn’t do a good job representing the diversity of humanity (Heard and Mlynarek, 2023)</li> </ul>

Continued management to prevent the spread of invasive species and to manage their undesired impacts requires broad support from communities. Researchers and environmental managers are far from the only parties involved in the management and control of invasive species: other important players in the landscape of invasion biology include people who could introduce new species, people that could spread existing invasive species, and people that experience their impacts. Effective invasive species prevention and management also requires support from community members that seemingly don't interact with invasive species or live in areas where management isn't actively occurring – yet. This widespread support is essential to sustained success with invasive species management work.

While the strategies employed to motivate these diverse groups may vary, a common challenge complicating support across these diverse communities is the language used in discussions surrounding invasion biology. Inconsistent terminology and varying interpretations thereof can engender confusion among communities and hinder management efforts (Iannone et al 2020). The choice of message frames and figurative language employed when communicating about invasive species can yield unintended consequences and prompt individuals to question their endorsement of such efforts. Additionally, when this language is coupled with place-based terminology, it can incite tensions among or against individuals associated with those locales (Reeve 2023, Shinozuka 2013). Even ostensibly neutral language concerning invasive species can pose issues, given that "invasion" inherently evokes a militaristic connotation, thereby framing discussions of invasion biology within a particular context and set of associations (Larson 2011).

All of these factors can significantly influence perceptions of invasion biology. Individuals who are immigrants themselves or hail from immigrant backgrounds, as well as those who have direct experiences with military conflict, may find the language of invasion biology discomforting. This linguistic framing can even lead them to empathize with the invasive species subject to management efforts and prompt them to question the validity of invasion biology work (CITE). Additionally, such language may also adversely affect professionals working within invasion biology, causing discomfort at best and outright aversion at worst, thereby hindering their identification with the objectives of invasive species management efforts (Bach & Larson 2017).

Although making large-scale changes to the language of invasion biology may pose a substantial challenge, individual-level solutions *are* attainable. Alternative language can be employed to discuss invasion biology, and naming conventions devoid of place-based references can be adopted to facilitate more effective invasive species management. Individual communicators have the agency to select alternative language when engaging in this crucial work. While comprehensive solutions may not be readily available, concerted efforts can bring about a shift in the prevailing language of invasion biology, fostering greater community support and ultimately enhancing the efficacy of invasive species management endeavors. The Invasive

Species Language Workshop, organized by Sea Grant and the North American Invasive Species Management Association (NAISMA) during National Invasive Species Awareness Week 2024, serves as an exemplar of collective action aimed at steering invasive species management towards a more effective and inclusive trajectory.

## Workshop Description:

The Invasive Species Language Workshop, funded by the NOAA Sea Grant College Program, was a first-of-its-kind workshop that brought together a small group of invasive species professionals, science communicators, and researchers to broadly share information and set a path forward for shifting the discourse in invasion biology. The workshop featured a half-day of virtual presentations on issues and solutions with naming conventions and message frames within invasion biology. There were at least 413 unique attendees to the event that accumulated the equivalent of 1,377 hours of viewing time, along with 649 additional individual views of the recorded webinar provided by NAISMA and posted on YouTube after the event. Workshop attendees reported finding the workshop valuable and that they heard numerous topics that were new to them. The Invasive Species Language Workshop was the single most attended webinar during NISAW, with more than twice as many people than the average of the other webinars. This evidence suggests that there is demand for this kind of information and that people who engage in this work are likely to find an audience for it.

**Day 1 (February 27):** The hybrid presentations on Day 1 focused on discussions and presentations regarding the use of language in the context of invasive species management. Various presentations highlighted the significance of inclusive language in naming and discussing species. This included talks on culturally insensitive names, historical legacies, and the impact of metaphors in shaping perceptions. Alternative frameworks for naming were proposed to ensure inclusivity and accuracy. A number of specific themes emerged from these presentations:

1. **Efforts in Renaming Species:** Presentations discussed ongoing projects aimed at renaming species with offensive or inappropriate names, as well as the process behind a number of renaming success stories. The process involved community engagement, extensive research into alternative names, and addressing biases.
  - a. *Words have power: A process to better common names.* Sam Chan (Oregon Sea Grant)
    - i. It's important to think about names that better engage the public we serve. What is the purpose of a common name for a species and how can names align with goals we have for invasive species management?
    - ii. Geographic identifiers are often used in common names because people think this is important information to provide. However, an analysis of the invasive species databases suggests that about 20% of invasive species common names have a geographic or cultural identifier.

- iii. Place-based names can be inaccurate and cause unintended actions. The process for changing these names is complex and there is a need to be very engaged in the process to improve outcomes.
- b. *The Entomological Society of America Better Common Names Project*. Erin Cadwalader (Entomological Society of America)
  - i. The BCNP process includes soliciting community input, recruiting working groups, creating and submitting proposals and reviewing them when they come back, and then adjusting and submitting the final proposal to the governing board for approval.
  - ii. Key lessons from this process so far include: dropping a name prior to selecting a replacement causes confusion, regulator agency collaboration is essential, a professional venue for people is needed, give opportunities for input, and create an inclusive or anonymous input options
  - iii. A link to the BCNP webpage is [here](#).
- c. *Renaming the Spongy Moth*. Leigh Greenwood (The Nature Conservancy)
  - i. First thing they did was call for candidate new names and got over 1,000 ideas from the public of which were narrowed down to 160. They researched native range names and translated or identified over 60 distinct local language names. They then used the Better Common Names Project naming best practices, as well as expert consultations with relevant scientists and management groups, to whittle them down to 30 acceptable candidate names. From that group, a few other names were removed due to issues like shared names with a moth in a different part of the world. The final group of seven names was then evaluated and a final decision was made based on a poll, feedback, and final discussion.
  - ii. After announcing the name spongy moth for *Lymantria dispar*, they got both good and bad press which was an unpleasant, but temporary process that was worth it in the end.
  - iii. However, there were six additional *Lymantria* species that were still using variations on old moniker as well as other problematic names and they dealt with these in the same way. One by one they worked through them much faster after having gained trust and having the inclusive and successful framework already established.
- d. *A Framework for Adopting More Inclusive Common Names*. Megan Weber (University of Minnesota Aquatic Invasive Species Research Center and the University of Minnesota Extension)
  - i. A discovery of a new invasive species in MN prompted questions to be sure the name was appropriate before making outreach materials for it.
  - ii. The existing University of Minnesota Extension Invasive Species Community of Practice settled on a set of guiding principles to decide on a common name. The steps include:
    - 1. Promoting use of scientific names which does not necessarily remove the geographic base of the name and isn't great for the general public,



2. Assessing common names in use by other groups by reviewing the various databases (EDDMapS) and/or in trade, and then use those names and cross them off the list one by one based on if they are inappropriate or duplicative,
  3. Then look to see how descriptive the name is (e.g., emerald ash borer is a good one).
  4. An example of narrowing down names for *Corbicula fluminea* was given.
- iii. Minnesota has adopted nineteen new names so far through this process: twelve of them were [worms](#), six were terrestrial plants, and one mollusk.
  - iv. A paper published on this work can be found [here](#).

2. **Standardizing Terminology:** Efforts were made to standardize invasive species terminology to improve outreach and communication. This involved developing consensus on terms and avoiding language that could be misleading or harmful, and included a number of case studies across different disciplines.

- a. *Standardizing Invasive Species Terminology for Stakeholder Education*. Basil Iannone (University of Florida)
  - i. The Florida invasive species council is a group of 39 scientists, expansion specialists and county agents whose expertise covers all taxa and underwent yearlong discussion terminology for invasive species
  - ii. Terms the work group suggests using more: including, native (with geographic context), nonnative, introduced, established, invasive, nuisance, range changing species
  - iii. Terms the working group suggests to avoid:
    1. *Native invasive* – this creates confusion; just use nuisance.
    2. *Invasive exotic* -- just use invasive.
    3. *Invasive weed* – weed can be native or nonnative; just use invasive.
    4. *Alien or foreign* – invokes political ideas; just use nonnative instead
  - iv. A paper published on this work can be found [here](#).
- b. *Setting expectations for invasive species management through consistent terminology*. Gadfly Stratton (University of Toronto)
  - i. An analysis of language used in invasive species management found a trend of mismatched meanings where people were referring to the exact same thing, but with different words. Similarly, the same words often meant different things to different people.
  - ii. Invasive species, risks, management, and engagement were all terms that had different meanings between professionals and community members. These misunderstandings can lead to conflict.



- iii. Invasive species engagement is HARD and disagreements will likely occur but inclusive practices and meeting people where they are can improve the process. Co-development and collaboration is key to prevent misunderstandings.

3. **Emotional Considerations and Framing:** Presentations addressed the emotional aspects of invasive species management and the importance of framing messages positively. Strategies for managing eco-anxiety, engaging communities effectively, and reframing negative language were discussed.

a. *Considering emotions when communicating and framing invasive species issues.*

Angie Gupta (University of Extension, Forestry)

- i. People, including professionals and participatory scientists, have eco-anxiety, which can lead to negative emotions with their work.
- ii. Communicators need to tailor messages to give hope and agency so that the community can do something that will make a meaningful difference. Managing emotions should be included in advice we give to the community.
- iii. We can help people manage grief, but recognizing feelings and reflecting on what happened is important. Create a way to process those feelings and empower hope and agency to produce nature based human health benefits.
- iv. This work is based on a project on invasive jumping worms ([found here](#)).

4. **Social Context and Inclusivity:** The importance of considering social contexts and diverse perspectives in invasive species management was emphasized. Efforts were made to shift language to respect and include diverse communities, with guidelines developed to promote inclusivity.

a. *An overview of inclusive language for invasion biology.* El Lower (Michigan Sea Grant)

- i. Culturally insensitive names exist, and while change can be hard, many benefits exist including easier identification and more welcoming language for communities.
- ii. Metaphors and how we talk about species can drastically alter the way we think about things. Within invasion biology, militaristic and nativist metaphors can also have undesirable consequences.
- iii. There are options for more inclusive and effective language, and the more of these options are available to us, the more effective we will be at managing biological invasions.
- iv. A link to a paper published on this work can be found [here](#).

- b. *Invasive Species Message Frame Tests on Social Media*. Tim Campbell (Wisconsin Sea Grant) and Laurel Downs (The Nature Conservancy)
    - i. Social media advertising provides “real world” data on how people respond to different invasive species message frames.
    - ii. One test suggests that militaristic and nativist message frames do not perform better than scientific, protective, or hitchhiker frames. Communication objectives can be achieved without using frames with potential unintended consequences.
    - iii. A different test found that emotional and protective appeals performed better than just fact-based frames.
    - iv. A link to a paper published on this work can be found [here](#).
5. **Interventions and Collaboration:** The meeting included discussions on other interventions and collaborative efforts to address problematic jargon in STEM fields. Recommendations included interdisciplinary collaboration, training on language use, and advocacy for inclusive language standards.
- a. *Just Language*. Neha Savant (New York City Parks)
    - i. Environmental management is often presented as objective, but in reality is subject to community values, which can vary. To move toward inclusive communication, it’s important to understand the community values in nature, including religious or spiritual beliefs.
    - ii. NYC Parks owns 14% of city acreage, 1/3 of which is natural areas (forests, wetlands, streams, grasslands).
    - iii. Urban systems such as NYC’s natural areas are generally considered degraded, but the reality is more nuanced. NYC Parks’ Natural Resources Group has been working to restore and maintain these ecosystems for the past 40 years, with staff and volunteers continuing to steward them.
    - iv. With the diversity of constituents that NYC Parks serves, shifting language to respect and include constituents’ lived experiences and perceptions is necessary.
    - v. NYC Parks developed voice and tone guidelines to help park staff be aware of careful language use including: minimizing describing species as “nonnative” and frame them around their ecological risk.
    - vi. The Just Language Project is also creating guides for intentional language use across organizations.
  - b. *Summary of ARC Network’s Exclusionary STEM Language Workshop*. Virginia Rhodes (WEPAN)
    - i. In 2022, the ARC Network held a “cultivating equity in STEM through inclusive language” workshop that discussed the following questions:
      - 1. What do we know about the effects of problematic jargon in STEM?

2. What might be done and by whom to eliminate the use of non-inclusive to intentionally use inclusive language?
  3. What are the possibilities for interdisciplinary collaboration on the issue of problematic jargon in STEM?
  4. What will be most impactful in persuading colleagues to eliminate the use of non-inclusive language & intentionally use inclusive language?
- ii. Non-inclusive language is embedded within all fields of STEM and a holistic remedy must challenge those inequities while including students and community members, and educators and those in power to achieve goals equitably.
  - iii. A summary report of this workshop can be found [here](#).

Overall, these presentations highlighted the need for inclusive and accurate language in invasive species management, with efforts focused on community engagement, standardization of terminology, and reframing messaging to promote positive action.

**Day 2 (February 28):** The second day of the workshop was a small working session for 15 people that discussed lessons learned from the presentations of the previous day and worked through a process similar to the ARC Network's process for exclusionary STEM language workshop to share information, identify consistent issues, and set a path forward (Herbers 2022).

Day 2 opened with a guided conversation among participants centered around the development of roadmaps and guidelines for language use in the invasive species realm, addressing problematic or inclusive language. Attendees discussed their work and its relevance to language issues, shared examples of problematic language perpetuating inequalities and inequities, and explored efforts within their disciplines/agencies to address non-inclusive language. We identified the need for incorporating community feedback or co-producing knowledge with impacted communities, reframing terminology, and considering the historical and cultural context of language use. Participants also raised concerns about tokenism, the importance of reflexivity, and the potential for backlash or pushback when advocating for language change. The conversation underscored the importance of creating inclusive narratives, recognizing diverse perspectives, and fostering meaningful engagement with communities affected by language choices.

The following four topics were identified as areas of work that are needed to further advance the ideas presented during day one of the workshop.

## Priority Research Areas:

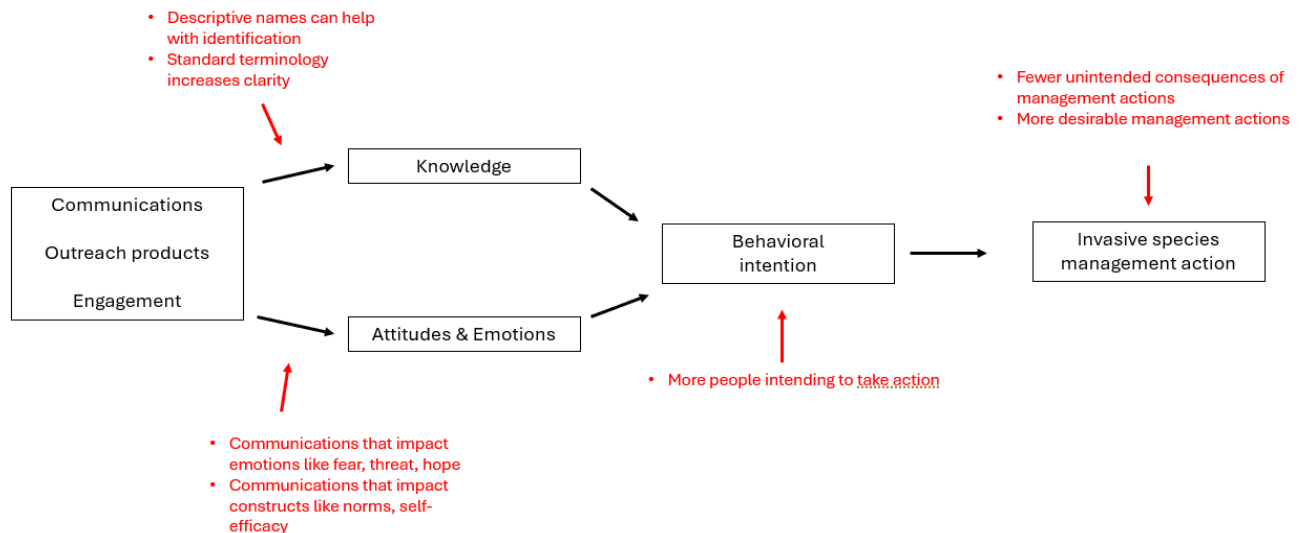
### *1. Building Evidence*

To many, the need for change is already clear and ample evidence exists to support change. Many of the unwanted impacts of language and naming conventions are known through lived experiences and told anecdotes. The authors respect these multiple ways of knowing and believe that this should be enough for change. However, we realize that not everyone is swayed by this evidence and that a greater, more systematic body of evidence will be needed, especially within the peer-reviewed literature, given science's collective bias towards the written word and English-language literature (Gordon and Gutierrez 2022). Specifically, evidence of the harms of poor language use and naming conventions and the benefits of more inclusive alternatives is needed.

Qualitative approaches can help capture the breadth of evidence that exists within stories and lived experiences of the communities we work and within our own invasion biology community. Consistently incorporating these narratives within peer-reviewed literature not only elevates their prominence but also endows them with the perceived credibility bestowed by the process of peer review. Conversely, quantitative methodologies can provide numerical data that may encourage certain individuals to adopt change: professionals in invasive species management may be taken aback to discover the extent of discomfort among their peers regarding prevailing language and nomenclature within the field. Moreover, quantitative methodologies can be instrumental in experimentally showcasing the advantages of different approaches to message framing and naming conventions. Interdisciplinary collaborations among researchers will be indispensable for engaging effectively in this work.

We ultimately believe that more inclusive approaches will work at least as well as problematic militaristic and nativist approaches, which is supported in the literature (Shaw et al 2021, Chinn et al 2023), and in some instances, will be more effective either through inspiring different emotional and behavioral responses or through a broader coalition of support – or both. **Fig. 1**, below, illustrates how inclusive language and naming conventions can be of particular utility in invasion biology.

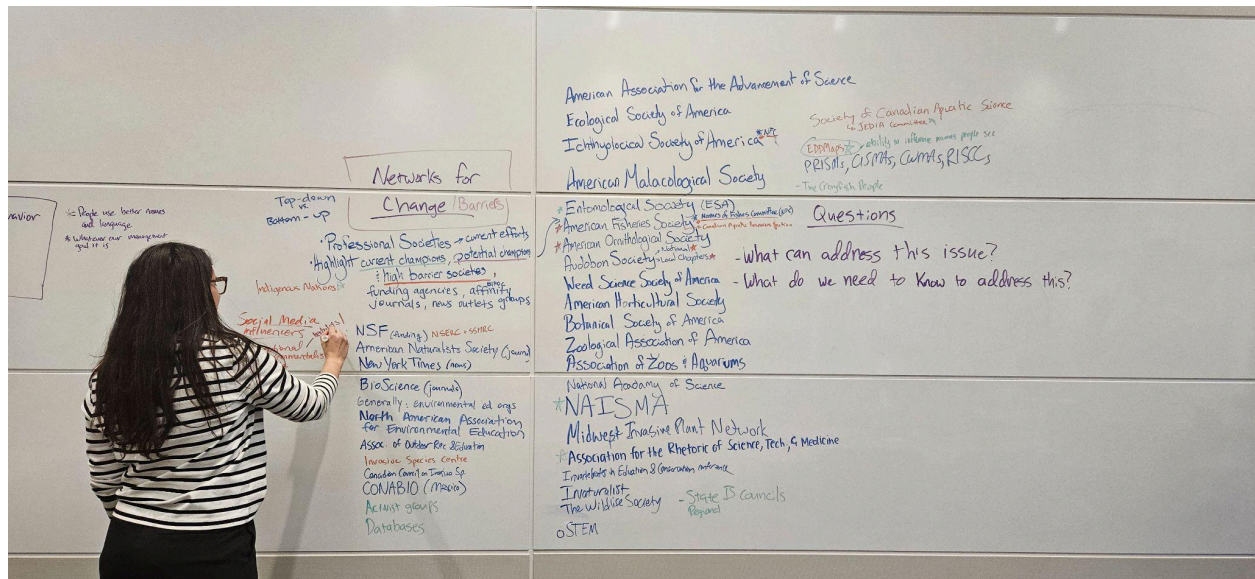
# How inclusive language & names help invasion biology



## 2. Identifying Networks of Change and Building Support

A significant challenge in advancing these initiatives lies in the complexity of identifying effective pathways for change. The diffusion of authority on language use complicates matters, as few individuals or organizations possess the requisite authority to enact substantial change, thereby hindering progress. In many circumstances, it is difficult for folks interested in making change to know who to contact to do it – and having a small number of people responsible means single individuals, or very small groups of people opposed to change, can block progress. Groups and organizations interested in making change sometimes feel they lack the authority to just do it themselves – a number of our workshop participants have witnessed professional societies and environmental organizations “pass the buck” about species name changes because there is no clear governing authority to provide guidance.

It is imperative to acknowledge where influence, rather than authority, can be used by both organizations and individuals to facilitate meaningful change. The tools and approaches for using influence, rather than authority, may be different than what people are familiar with, and the people in the best position to leverage influence may be different. Becoming familiar with these tools and organizations will be key to implementing change.



*Workshop participants build out a list of professional societies who can act as networks for change.*

Likewise, understanding that different audiences may require diverse approaches and motivations for embracing change underscores the necessity of engaging diverse networks. Collaborative efforts are indispensable in navigating these networks to garner support and momentum for addressing critical issues.

### 3. Coproduction of Interventions

Historically, the establishment of standard language use and narratives in science has often been dictated by a small subset of humanity that has not reflected the diversity of the public, perpetuating systemic biases and overlooking community perspectives. To avoid replicating such oversights, it is crucial to engage with communities in a process of co-production, ensuring that language and interventions (in this case, programs and educational materials to implement better language and naming conventions) resonate as broadly as possible and that we are not unwittingly changing language to something else that is exclusionary as well. By actively involving communities in the process of changing language, we mitigate the risk of inadvertently perpetuating problematic paradigms and demonstrate a commitment to serving their interests while also upholding our own commitments to positive ecological and community outcomes around invasive species management actions.

As we environmental researchers and science communicators engage in this work, we need to be aware of existing power dynamics and historical context, and to create spaces for building shared understandings between researchers, managers, and our intended audiences. This includes engaging vulnerable, impacted, and marginalized communities and people with shared definitions and expectations of co-production and engagement. This can help maintain accessible communication channels that will help with intervention development to best meet

the needs of impacted communities. At the same time, it is important to retain accurate and effective communications: a balanced approach including all these elements within the core management, science, and audience contexts will be the most likely to succeed.

#### *4. Operationalizing Interventions*

As resources and methods for more inclusive and effective communication become known and available, professionals and communities alike will need help making use of them in their work and initiatives. For those uncomfortable with the prevailing language of invasion biology, alternative communication strategies currently exist that can effectively convey the same information without perpetuating dominant narratives. Resources such as the ESA's Better Common Names project, the Just Language project, and others provide examples of such alternatives. Unfortunately, not everyone knows of these resources, and additional efforts are needed to make people aware of them. This can be done by expanding educational opportunities through webinars and online courses, such as those offered by NAISMA and through the ANSTF AIS Outreach Community of Practice, to broaden awareness and understanding of pertinent issues. Establishing a shared national resource through these larger, national venues can further facilitate alignment and coherence in addressing these challenges, fostering collective action towards meaningful solutions. These documents could include community guides, language guidelines, and draft letters of support for these kinds of initiatives.

Meeting people where they are at with this information at conferences, working group meetings, and community events should also be a priority. There are many people who do limited work with invasive species and are unlikely to discover this information in many of the ways an invasive species professional would. Ensuring that this information flows through to all possible users is something that will allow these changes to positively impact all communities.

As more evidence of harm of some historical communication practices is documented, and new interventions are co-produced with communities, new and additional approaches will be needed to help communities use this information. Buy-in from as many communities as possible will be needed, from national level organizations and working groups (e.g. NAISMA or the Aquatic Nuisance Species Task Force) to local place-based organizations. As we work with these groups, it will be important to understand the different motivations people have for this kind of work and to identify the different levels of capacity that people have for this work. This can help set reasonable expectations for future work while framing the work in a way that helps people be motivated to complete it. One potential reframing of this work is to discuss it within a professional development or continuing education framework, since understanding these concerns can help professionals become more effective and can help anyone better understand the communities in which they live and work.

Potential barriers to operationalizing interventions for inclusive language in invasion biology include lack of acceptance of the need for and justifications for change, understanding who is responsible for this work, what are attainable goals, who funds the work, and how we evaluate



any impacts of the work. Connecting academic researchers who study language use with communication program managers could create a shared sense of discovery that helps drive this work forward. Identifying leaders and responsible parties through professional societies and invasive species professionals will also help operationalize any potential future interventions. Finally, understanding funding mechanisms for this work will be imperative to it occurring. Interdisciplinary projects and funding sources that involve social science and communication may be a good first place to look.

## **Workshop evaluation:**

The Invasive Species Language Workshop was well attended, with 413 unique users logging into the webinar during the hybrid portion and 642 (as of 9.19.24) have watched the recording of the event. Multiple attendees indicated that they hosted “watch parties” for the hybrid event. For reference, the average NISAW webinar receives about 200 attendees. We believe the attendance and engagement alone in this workshop indicates the interest in the topic.

A post-event evaluation survey was distributed at the end of the hybrid portion and sent directly to attendees via email. There were 53 attendees that completed the survey, for a 13% response rate. The evaluation respondents were split between people that rarely work with naming and language issues and people that work with this issue regularly. Across both categories, people learned between a moderate amount and a great deal (3.71 on a 1-5 scale), even though less of the content (3.17 on a 1-5 scale) was new to them. This suggests that even if they had seen the content before or heard about the issue, the workshop speakers presented information in a way that contributed to learning. Finally, evaluation respondents indicated that they were very supportive (4.52 on a 1-5 scale) of future efforts in this space, although of course people that aren’t inclined to be supportive of this work likely would not have attended the event.

Open-ended comments from the respondents generally indicated support and appreciation for both the event and this line of research. Comments outside of support and appreciation included balancing inclusive language with what environmental professionals feel works and expressing feelings of reactance, both their own perspective as well as the perspective of other people working with invasive species. These comments could be further explored as future research within the “Building Evidence” umbrella.

## **Conclusions:**

While the topic of the Invasive Species Language Workshop, and thus this report, centers on inclusive language within invasion biology specifically, be assured that this is also a topic of concern across other STEM disciplines. There are problematic terms and names throughout all STEM disciplines that can confuse or alienate practitioners and the public, prevent people working in those fields from talking about their research effectively, and can ultimately cause people to turn away from important scientific work (Herbers et al 2022).

Many of the reasons for not engaging in this work and making these changes are grounded in biases or logical fallacies. The status quo bias (Samuelson and Zeckhauser, 1988) and sunk cost fallacy (Arkes and Blumer, 1985) contribute to the ideas that we should keep things as they are because it is how the field has always done things – and that the field has so much invested in the current situation that it doesn't make sense to change. These arguments ignore that there are ways to communicate that better align with our management goals and values, and also ignores what we fail to gain by not adopting these approaches. We also hear that, as scientists, our work and terminology is neutral and unbiased, yet we know that is not the case. As people, scientists have values and biases like the rest of humanity, and that can be intentionally and unintentionally reflected in our work (Simundic, 2013). Previous researchers have suggested that we should be more conscientious of the values of our language and instead of pretending it is neutral, be aware of and intentional with the frames we use (Verbrugge et al 2021). We predict that by adopting these approaches, we stand to gain a broader base of support for invasive species management, greater job satisfaction by those engaged in the work, and ultimately more effective management through stronger motivations.

All of the answers do not currently exist to address these problems, and those that do exist might not be perfect. It may not be practical to change some aspects of language use in the field of invasion biology, and other aspects may only be feasible to change for certain audiences or to address particular needs. However, this should not prevent the work from being done. As researchers, practitioners, and science communicators, we can work together to build on the body of literature that demonstrates and analyzes the impacts of our communications. We can develop and promote alternative vocabularies for the concepts of invasion biology that are available to everyone. We can build networks of support to influence change across our respective fields, broaden the base of support for our work, and help our colleagues see themselves in the work we collectively do. Through this process, our communities can find better balance with what they need from the environment and the impacts of invasive species.

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## Appendix:

[Rhetoric of Invasion Reading List: A Selected Bibliography | Michigan Sea Grant](#)

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